

Valve and Method For Repairing a Valve Under Pressure

BACKGROUND OF THE INVENTION

1. Technical Field

[01.00] This invention relates generally to valves for lines carrying water, sewage, natural gas, or other fluid, and more particularly to a valve and method for repairing a valve under pressure without first shutting down the line.

2. Description of Related Art

[02.00] A typical valve may be manufactured from any of various materials, including ductile iron, cast iron, stainless steel, brass, plastics, and/or any of various exotic materials needed in special applications. The size can range from 1/4-inch diameter or less to a 144-inch diameter or more. The valve may include a one-piece valve body with a hollow interior that extends between first and second ends of the valve body. The first and second ends are threaded, flanged, grooved, or otherwise configured so that a user can readily connect each end to a respective one of separate first and second pipeline sections, either directly or via intermediate fittings. In that regard, the term "pipeline" includes any type, size, and composition of fluid-carrying conduit, and the hollow valve body interior couples the first and second pipeline sections in fluid communications.

1 [03.00] What is sometimes called a valve-stopping mechanism is mounted in the valve body. More specifically, part of the valve body defines an opening in the valve body that provides access to the hollow valve body interior. The valve-stopping mechanism is removably mounted
5 within that opening in fluid-tight engagement of the valve body. There, it functions as means for enabling the user to selectively stop and unstop fluid communications between the first and second pipeline sections (i.e., between the first and second ends of the valve body). The opening in the valve body will subsequently be referred to as an "access opening," and
10 the portion of the valve body that defines the access opening will subsequently be referred to as an "opening-defining portion" of the valve body. The valve-stopping mechanism is sometimes called a user-operated, isolator mechanism or valving element. Known valve-stopping mechanisms include metal gate, rubber coated gate,
15 butterfly, plug, ball, and check valve stopping mechanisms, each having its own special features and advantages. In addition, the hollow interior of the valve body may include mating surfaces cast into the body or attached to the body by known valve technology to create a seating surface for the valve-stopping mechanism. Attached materials may include
20 brass, steel, stainless steel, plastics, and other known materials.

[04.00] Regardless of the particular style of the valve-stopping mechanism, a valve is prone to becoming corroded, obstructed by mineral and/or chemical deposits or debris, or otherwise damaged to the point that
25 it requires servicing in order to clean or resurface the hollow valve body interior and/or to clean, resurface, or replace the valve-stopping mechanism. The line may have to be shut down so that the valve is not

1 under pressure. The valve is then serviced and afterwards the line is
turned back on. However, the consequences of shutting down the line
may be significant. For example, shutting down a municipal water main in
order to service a branch line to a subdivision results in many
5 inconvenienced and potentially monetarily damaged water customers.

[05.00] Undertaking to shut down hospital systems, manufacturing plants,
hotels, or nuclear facilities is also fraught with adverse consequences,
including the cost of a plant shut down or the lack of fire protection during
10 the shut down. The problem exists with gas valves, air valves, water
valves, sewage valves, steam valves, any of numerous chemical valves,
and other fluid valves for above ground and below ground pipe, including
sub-sea systems. Thus, a need exists for a valve and repair method such
that the valve can be installed when the pipe is installed and then serviced
15 under pressure (i.e., with the valve containing fluid under pressure)
without shutting down the line.

SUMMARY OF THE INVENTION

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[06.00] This invention addresses the concerns outlined above by
providing a valve having a valve body with an opening-defining portion
that includes connection-facilitating means for facilitating the fluid-tight
removable connection of what is referred to herein as a separate "isolation
25 valve assembly" onto the opening-defining portion of the valve body. The
connection-facilitating means facilitates connection of the isolation valve
assembly in a position over the access opening that enables a user to

1 remove the valve-stopping mechanism through the isolation valve
assembly. A valve-servicing assembly that includes such an isolation
valve assembly and an attached pressure-chamber-defining structure is
used for valve-servicing purposes so that the valve-stopping mechanism
5 can be removed from the access opening through the isolation valve
assembly and into the chamber-defining structure while the valve is under
pressure (i.e., the valve contains fluid under pressure). The
chamber-defining structure may be similar in many respects to known
equipment, and servicing or replacement of the valve-stopping mechanism
10 and valve body cleaning can be conducted using the pressure chamber
while the valve contains fluid under pressure. Thus, a shut down with all
the potential adverse consequences is avoided.

[07.00] To paraphrase some of the more precise language appearing in
15 the claims and further introduce the nomenclature used, a valve
constructed according to the invention includes a valve body and a
valve-stopping mechanism. The valve body has first and second ends and
it defines a hollow valve body interior extending between the first and
second ends that couples the first and second ends in fluid
20 communications. The valve body includes an opening-defining portion that
defines an access opening in the valve body. The valve-stopping
mechanism is removably mounted within the access opening where it
functions as means for enabling a user to selectively stop and unstop fluid
communications between the first and second ends of the valve body.

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[08.00] According to a major aspect of the invention,
connection-facilitating means are provided on the opening-defining

1 portion of the valve body for facilitating the fluid-tight removable
connection of a separate isolation valve assembly to the opening-defining
portion of the valve body. The connection-facilitating means facilitate
connection of the isolation valve assembly in a position over the access
5 opening that enables the user to remove the valve-stopping mechanism
from the access opening through the isolation valve assembly. The
connection-facilitating means facilitate such a connection without
obstructing removal of the valve-stopping mechanism from the access
opening. The connection-facilitating means may include one or more of
10 a flange, an exterior thread, annular grooves, annular rings, or a cam lock
arrangement. Other forms of connection-facilitating means may be
employed within the scope of the broader claims. Whatever the form, the
connection-facilitating means are part of the valve so that they are ready
to use when needed.

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[09.00] In line with the foregoing, a method for repairing such a valve
under pressure includes the step of providing a valve-servicing assembly
of which the isolation valve assembly is a part. The isolation valve
assembly has first and second ends and a size large enough to enable a
20 user to remove the valve-stopping mechanism from the access opening
through the isolation valve assembly. The valve-servicing assembly
includes a chamber-defining structure connected to the second end of the
isolation valve assembly that defines a pressure chamber (i.e., a fluid-tight
chamber) in which the valve-stopping mechanism fits.

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[10.00] The method proceeds by connecting the first end of the isolation
valve assembly to the opening-defining portion of the valve body in a

1 position over the access opening. Next, the valve-stopping mechanism is withdrawn from the access opening, through the isolation valve assembly, into the fluid-tight chamber. Then, the isolation valve assembly is closed.

5 [11.00] In the case of repairing the valve-stopping mechanism, the method includes removing the valve-stopping mechanism from the fluid-tight chamber and servicing the valve-stopping mechanism, placing the valve-stopping mechanism back into the fluid-tight chamber, opening the isolation valve assembly, advancing the valve-stopping mechanism
10 from the fluid-tight chamber through the isolation valve assembly back into the access opening. In the case of replacement, the replacement valve-stopping mechanism is placed into the chamber and advanced into the access opening. In either case, the valve-servicing assembly may be removed from, or left connected to, the opening-defining portion of the
15 valve body.

[12.00] Thus, the invention significantly facilitates the repair under pressure of a valve so that the line does not have to be shut down. Preferably, the valve is installed when the pipeline is installed. When the
20 valve requires repair, the valve-servicing assembly is connected to the opening-defining portion of the valve body and repair is undertaken under pressure. If it is desired, just a valve body with a plugged or capped access opening may be installed without the valve-stopping mechanism instead of installing the entire valve. In that case, a valve-stopping
25 mechanism can be added under pressure if it is ever needed. The following illustrative drawings and detailed description make the foregoing

1 and other objects, features, and advantages of the invention more
apparent.

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BRIEF DESCRIPTION OF THE DRAWINGS

[13.00] FIG. 1 of the drawings is an isometric view of a valve constructed
according to the invention;

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[14.00] FIG. 2 is an elevation view of the valve, with portions in cross
section as viewed in a plane containing a line **2-2** and the rotational axis
in FIG. 1;

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[15.00] FIG. 3 is an elevation view of the valve, with portions in cross
section as viewed in a plane containing a line **3-3** and the rotational axis
in FIG. 1;

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[16.00] FIG. 4 is a plan view of the valve, with portions in cross section
as viewed in a plane perpendicular to the rotational axis that contains a
line **4-4** in FIG. 3;

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[17.00] FIG. 5 is a plan view of the valve, with portions in cross section
as viewed in a plane perpendicular to the rotational axis that contains a
line **5-5** in FIG. 3;

1 **[18.00]** FIGS. **6a** through **6g** are diagrammatic representations of various steps of the valve repair methodology of the invention;

[19.00] FIG. **7** is an isometric view of a second embodiment of a valve
5 constructed according to the invention;

[20.00] FIG. **8** is an enlarged cross sectional elevation view of just the valve body of the second embodiment as viewed in a plane containing a line **8-8** and the rotational axis in FIG. **7**;

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[21.00] FIG. **9** is an enlarged elevation view similar to FIG. **8**, but with the valve-stopping mechanism added;

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[22.00] FIG. **10** is another elevation view of the second embodiment with a valve-servicing assembly illustrated diagrammatically connected over the access opening;

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[23.00] FIG. **11** is an elevation view similar to FIG. **9** of a portion of a third embodiment constructed according to the invention showing various means for facilitating the connection of the valve-servicing assembly; and

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[24.00] FIG. **12** is an elevation view similar to FIG. **9** of a portion of a fourth embodiment of a valve constructed according to the invention showing a cam lock arrangement for facilitating connection of the valve-servicing assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

1 [25.00] FIGS. 1-5 of the drawings show various aspects of a valve 10 constructed according to the invention. Generally, the valve 10 includes
5 first and second subassemblies referred to in this description as a valve body 11 and a valve-stopping mechanism 12 (FIGS. 1-3). The valve body 11 is preferably a one-piece structure that extends along a valve body axis 13 between first and second ends 14 and 15 of the valve body 11 (FIGS 1-5), and it defines a hollow valve body interior 16 (FIG. 2)
10 that couples the first and second ends 14 and 15 in fluid communications. The valve body 11 is composed of ductile iron, steel, composite material, or other suitable composition and the ends are connected to first and second pipeline sections 17 and 18. The valve body 11 may be one-piece because it is not installed over the pipeline at some later date as a retrofit.
15 It is installed with the pipeline sections 17 and 18.

[26.00] The OD of the illustrated six-inch pipeline sections 17 and 18 might typically measure about 6.5 inches to 7.75 inches, but the invention works on any of various sized pipeline with 1/4-inch or less diameter up
20 to 114-inch or larger diameter. A valve body constructed according to the invention is sized according to the pipe OD with which it will be used. The valve body 11 of the illustrated valve 10 fits the six-inch OD of the pipe 18, with the valve body 11 and the first and second pipeline sections 17 and 18 disposed coaxially relative to the valve body axis 13.
25 Each of the first and second glands 19 and 20 (FIGS. 1 and 2) bolts onto a respective one of the first and second ends 14 and 15 of the valve

1 body **11** where they bear against first and second split rubber seals **21**
and **22** (FIG. 2) in order to seal the first and second ends **14** and **15** of
the valve body **11** on the first and second pipeline sections **17** and **18** in
fluid-tight connections. The glands and rubber seals may take the form of
5 known types of components.

[27.00] The valve body **11** includes an opening-defining portion **23** that
defines an access opening **24** in the valve body **11** (FIGS. 2 and 5). A
portion of the valve-stopping mechanism **12** is broken away in FIG. 5 for
10 illustrative reasons to expose the access opening **24**. The valve-stopping
mechanism **12** is removably mounted in the access opening **24** where it
functions as means for enabling a user to selectively stop and unstop fluid
communications between the first and second ends **14** and **15** of the valve
body **11**. The valve-stopping mechanism **12** includes a flange-mating
15 portion **12A** that is shaped and dimensioned to fit into the access
opening **24** in a fluid-tight fit. The flange-mating portion **12A** may include
an O-ring seal. Set screws extending through a flange **23A** on the
opening-defining portion **23** of the valve body **11** function as means for
holding or vertically restraining the valve-stopping mechanism **12** within
20 the access opening **24**. For illustrative reasons, just one set screw **12B**
is identified in FIG. 2 and just one other set screw **12C** is identified in
FIG. 3. A retainer ring **23B** bolts onto the flange **23A** to help secure the
valve-stopping mechanism **12** in place.

25 [28.00] The illustrated valve-stopping mechanism **12** includes a
bonnet **25**, a gate **26**, and a gate-advancing mechanism **27** (e.g., a

1 rotatable threaded stem and nut combination). The gate-advancing
mechanism **27** functions as means for enabling a user to advance the
gate **26** between open and closed positions of the gate **26**. The
gate-advancing mechanism **27** advances and withdraws the gate **26** in
5 response to the user turning a square head portion **28** of the
gate-advancing mechanism **27** (e.g., with a wrench or other suitable
head-engaging tool). As the square head portion **28** rotates on a
rotational axis **29** that is perpendicular to the valve body axis **13**, the
gate **26** advances or withdraws along the rotational axis **29**.

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[29.00] In the closed position of the gate **26** illustrated in FIGS. **2-5**, the
gate is disposed intermediate the first and second ends **14** and **15** of the
valve body **11**, with the gate **26** being in fluid-tight engagement of the
valve body **11** (or conventional types of seating arrangements attached to
15 the valve body **11**) and preferably in fluid-tight engagement of the
flange-mating portion **12A** of the valve-stopping mechanism **12**. So
disposed, the gate **26** blocks (stops) the flow of fluid through the valve
body **11** between the first and second ends **14** and **15** and between the
first and second pipeline sections **17** and **18**. In the open position of the
20 gate **26**, the gate **26** does not block the flow of fluid through the valve
body **11** because the gate **26** is withdrawn from the closed position as
depicted by the phantom line **26A** in FIG. **3**.

[30.00] The illustrated gate **26** is fabricated from ductile iron in the
25 desired shape and then a rubber coating is bonded on using known
transfer mold compression mold, or other techniques. The rubber coating

1 helps effect the desired fluid-tight seal between the gate **26** and the valve
body **11** and, if desired, between the gate **26** and the bonnet **25** of the
valve-stopping mechanism **12** if the need arises. As an idea of size, the
illustrated gate **26** (for use with six-inch pipe) measures about 9.0 inches
5 wide.

[31.00] According to a major aspect of the invention, the valve **10**
includes means on the opening-defining portion **23** of the valve body **11**
for facilitating the fluid-tight removable connection of a separate second
10 valve assembly (referred to herein as an isolation valve assembly) to the
opening-defining portion **23** of the valve body **11**. Those means are
referred to herein as connection-facilitating means and they facilitate
connection of the isolation valve assembly subsequently described over
the access opening **24** in a position that enables the user to remove the
15 valve-stopping mechanism **25** from the access opening **24** through the
isolation valve assembly. The connection-facilitating means facilitate such
a connection without obstructing removal of the valve-stopping mechanism
from the access opening **24**. The flange **23A** serves the
connection-facilitating function for the valve **10** in addition to supporting
20 the retainer ring **23B**. In other words, the opening-defining portion **23** of
the valve body **11** includes a flange **23A** that functions as means for
facilitating the connection of the isolation valve assembly to the
opening-defining portion **23** of the valve body **11** by bolting. The user
removes the retainer ring **23B** from the flange **23A** (unbolts it) and then
25 bolts the isolation valve assembly to the flange **23A**.

1 [32.00] The use of a valve-servicing assembly **30** that includes an
isolation valve assembly **31** and a chamber-defining structure **32** is
illustrated in the diagrammatic views of FIGS. **6a-6b**. First consider
FIG. **6a**. It shows the valve **10** installed between the first and second
5 pipeline sections **17** and **18**, and it is assumed here that the valve **10** is
in need of servicing. In servicing the valve **10** according to the invention,
the valve-servicing assembly **30** is connected to the flange **23A** on the
opening-defining portion **23** of the valve body **11**. That is done for the
valve **10** by bolting the isolation valve assembly **31** directly to the
10 flange **23A**. However, the term "connection" herein also includes an
indirect connection via one or more intermediate fittings or other
components (e.g., a size adapter fitting).

[33.00] The arrows in FIG. **6b** show the direction a user moves the
15 valve-servicing assembly **30** relative to the valve **10** (along the rotational
axis **29**) to place it in position over the access opening **24** (described
earlier with reference to FIGS. **2** and **5**) in the opening-defining portion **23**
of the valve body **11**. That is done with the isolation valve assembly **31**
open. illustrated isolation valve assembly **31** is a gate valve that includes
20 first and second ends **31A** and **31B** (identified in FIG. **6b**) and a gate **31C**
that is shown in FIG. **6b** in an open position. However, any of various
known types of valves can be used as an isolation valve as long as the
valve-stopping mechanism can pass through it. The gate **31C** can be
closed to seal off the access opening **24** when desired, and opened to
25 expose the access opening **24**.

1 **[34.00]** The chamber-defining structure **32** connects to the second
end **31B** of the isolation valve assembly **31** to form the valve-servicing
assembly **30**. With the valve-servicing assembly **30** connected in
fluid-tight engagement of the flange **23A** by connection of the first
5 end **31A** of the isolation valve assembly **31** to the flange **23A**, and with the
gate **31C** in an open position, the valve-stopping mechanism **12** is
withdrawn from the access opening **24**. It is withdrawn through the open
isolation valve assembly **31** into a pressure chamber **33** (identified in
FIG. **6b**) within the chamber-defining structure **32**. Withdrawal of the
10 valve-stopping mechanism **12** into the chamber-defining structure **32** is
depicted in FIG. **6c**. It is accomplished using a user-operated, moveable
component **34** that is part of the valve-servicing assembly **30**. The
illustrated moveable component **34** is constructed according to known
techniques to grip, turn, and withdraw the valve-stopping mechanism **12**
15 under user control.

[35.00] Next, the user closes the isolation valve assembly **31** by moving
the gate **31C** to the closed position as depicted in FIG. **6d**. Doing so
isolates the chamber **33** in the chamber-defining structure **32** from the
20 access opening **24** in the valve body **11**. With the access opening **24**
closed in that manner (i.e., isolated), the user removes the valve-stopping
mechanism **12** from the chamber-defining structure **32** for repair or
replacement. Before placing a repaired or replacement valve-stopping
mechanism back into the chamber-defining structure **32**, the user can
25 clean, or resurface the hollow valve body interior **16** (described earlier
with reference to FIGS. **2** and **4**) through the isolation valve assembly **31**

1 using the moveable component **34** in the chamber-defining structure **32** of the valve servicing assembly **30**.

5 [36.00] After that, the user places a repaired or replacement valve-stopping mechanism **12A** into the chamber-defining structure **32** and opens the isolation valve assembly **31** as depicted in Fig. **6e**. The valve-stopping mechanism **12A** is then mounted in the access opening **24** defined by the opening-defining portion **23** of the valve body **11** and the valve-servicing assembly **30** is removed as depicted in FIG. **6f**. That
10 results in the serviced valve **10** depicted in FIG. **6g** without shutting down the line.

[37.00] With further regard to the valve-servicing assembly **30**, the chamber-defining structure **32** may take the form of a modified "completion
15 tool." A completion tool is a known existing tool used for inserting products into pressurized pipeline systems that has been converted with well known methods to include the moveable component **34** that enables the user to grip and remove the valve-stopping mechanism **12** from the access opening **24**, to grip and manipulate components for cleaning and
20 resurfacing of the hollow valve body interior **16** of the valve body **11**, and to grip and install the valve-stopping mechanism **12A** into the access opening **24**. It enables the user to do those things under pressurized conditions and it is familiar to one of ordinary skill in the art.

25 [38.00] To summarize the above-described methodology, the method is one for repairing under pressure a valve having a valve body, an

1 opening-defining portion of the valve body that defines an access opening,
a valve-stopping mechanism removably mounted within the access
opening, and means on the opening-defining portion of the valve body for
facilitating the connection of a separate isolation valve assembly to the
5 opening-defining portion. The method includes the step of providing a
valve-servicing assembly of which the isolation valve assembly is a part
such that the isolation valve assembly has first and second ends and a
size large enough to enable a user to remove the valve-stopping
mechanism from the access opening through the isolation valve assembly,
10 the valve-servicing assembly including a chamber-defining structure
connected to the second end of the isolation valve assembly that defines
a chamber in which the valve-stopping mechanism fits. The method
proceeds by connecting the first end of the isolation valve assembly to the
opening-defining portion of the valve body in a position over the access
15 opening, withdrawing the valve-stopping mechanism from the access
opening, through the isolation valve assembly, into the fluid-tight chamber,
and closing the isolation valve assembly.

[39.00] In the case of repair, the method also includes the steps of
20 removing the valve-stopping mechanism from the fluid-tight chamber and
servicing the valve-stopping mechanism. The method then proceeds by
installing a completion tool within the chamber-defining structure, opening
the isolation valve, advancing the completion tool into the access opening,
and performing cleaning and/or resurfacing of the hollow valve body and
25 the seating area for the valve-stopping mechanism. After that, the method
proceeds by retracting the completion tool, closing the isolation valve,
placing the valve-stopping mechanism back into the fluid-tight chamber,

1 opening the isolation valve assembly, and advancing the valve-stopping
mechanism from the fluid-tight chamber through the isolation valve
assembly back into the access opening. In the case of replacement, the
method includes the steps of removing the valve-stopping mechanism from
5 the fluid-tight chamber, placing a replacement valve-stopping mechanism
into the fluid-tight chamber, cleaning and/or resurfacing as may be
needed, opening the isolation valve assembly, and advancing the
replacement valve-stopping mechanism from the fluid-tight chamber
through the isolation valve assembly into the access opening. In either
10 case, the user may disconnect the first end of the isolation valve assembly
from the opening-defining portion of the valve body.

[40.00] Based upon the foregoing and subsequent descriptions, one of
ordinary skill in the art can readily practice the invention and incorporate
15 various changes without departing from the scope of the claims. The
valve body, for example, may be manufactured from any of various
materials, including ductile iron, cast iron, stainless steel, brass, plastics,
and any of various exotic materials needed in special applications. The
size can range from 1/4-inch diameter or less to a 144-inch diameter or
20 more. In addition, the first and second ends of the valve body configured
so that a user can readily connect each end to a respective one of
separate first and second pipeline sections, either directly or via
intermediate fittings using any of various known connection means,
including flanged, mechanical joint, pipe threads, solder, welded ends,
25 compression and push-in fittings, and grooved locking methods including
cam locks or bayonet-type locks similar to those used in kitchen blenders,
camera lenses, or bolt action rifles. The valve-stopping mechanism may

1 take any of various known forms, including metal gate, rubber coated gate,
butterfly, plug, ball, and check valve stopping mechanisms, and the
connection-facilitating means may take any of various forms including a
flange, a threaded portion, grooved locking methods, machine screw
5 connections, and any of many other known locking means.

[41.00] FIGS. 7, 8, 9, and 10 illustrate various aspects of a second
valve embodiment (a valve 100) that incorporates some of the
above-mentioned alternatives. The valve 100 is similar in some general
10 respects to the valve 10 and so only differences will be described in
further detail. For convenience, numerals designating parts of the
valve 100 are increased by one hundred over numerals designating
similar, corresponding, or related parts of the valve 10.

15 [42.00] The valve 100 includes a valve body 111 and a valve-stopping
mechanism 112 (FIG. 7). They are composed of brass. The valve
body 111 has first and second ends 114 and 115 and a hollow
interior 116 (FIGS. 8-10) that extends along an axis 113 between the first
and second ends 114 and 115. The valve 100 is illustrated with the first
20 and second ends 114 and 115 connected by interior pipe threads 141
and 142 to first and second pipeline sections 117 and 118.

[43.00] The valve body 111 includes an opening-defining portion 123 that
defines an access opening 124 (FIGS. 8-10). The valve-stopping
25 mechanism 112 is mounted removably in the access opening 124 by
means of an interior thread 143 (FIGS. 8-10) on the opening-defining

1 portion **123** that functions as means for holding or vertically restraining the
valve-stopping mechanism **112** within the access opening **124**. The user
rotates a wheel **144** (FIGS. 7-9) that is held on the valve
stopping-mechanism **112** by a nut **145** (FIG. 7) in order to advance and
5 withdraw the valve stopping-mechanism **112** along a rotational axis **129**
as depicted by the arrows in FIG. 9. Doing so stops and unstops fluid
flow through the valve body **111**.

[44.00] The opening-defining portion **123** of the valve body **111**
10 includes connection-facilitating means in the form of an exterior
thread **146** (FIGS. 7-10). The thread **146** functions as means on the
opening-defining portion **123** of the valve body **111** for facilitating the
fluid-tight removable connection of a separate isolation valve
assembly **131** (FIG. 10) to the opening-defining portion **123** of the valve
15 body **111** in a position over the access opening **124** that enables the user
to remove the valve-stopping mechanism **112** from the access
opening **124** through the isolation valve assembly **131**. The isolation
valve assembly **131** is part of a valve-servicing assembly **130** that
includes a chamber-defining structure **132** (FIG. 10). The isolation valve
20 assembly **131** has a first end **131A** that connects to the opening-defining
portion **123** using the exterior thread **146**, and a second end **131B** to
which the chamber-defining structure **132** is connected.

[45.00] FIG. 11 illustrates a third embodiment with different
25 connection-facilitating means. It is designated as a valve **200** with a
valve-stopping mechanism **212**. The valve **200** is similar in many respects

1 to the valve **100** and so only differences will be described in further detail.
For convenience, numerals designating parts of the valve **200** are
increased by one hundred over numerals designating similar,
corresponding, or related parts of the valve **100**.

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[46.00] A first connection-facilitating arrangement illustrated by the
valve **200** is an annular groove **250** in an opening-defining portion **223** of
the valve. The valve-servicing assembly **230** includes an annular
groove **251** also. A sealing member **252** (e.g., elastomeric ring) is
10 disposed between the grooves **250** and **251** to effect a fluid-tight seal.
The sealing member **252** has been omitted on one side of the
opening-defining portion **223** in FIG. **11** for illustrative reasons in order to
expose the grooves **250** and **251** for identification. A second
connection-facilitating arrangement by the valve **200** is an annular
15 groove **253** in the opening-defining portion **223** that mates with a radially
inwardly protruding annular ring **254** of the valve-servicing assembly **230**.
A portion of the valve-servicing assembly **230** has been broken away in
FIG. **11** for illustrative reasons in order to expose the groove **253** for
identification. A third connection-facilitating arrangement illustrated by the
20 valve **200** is a radially outwardly protruding annular ring **255** that mates
with an annular groove **256** in the valve-servicing assembly **230**. A portion
of the opening-defining portion **223** in has been broken away for
illustrative reasons in order to expose the groove **256** for identification.
A compression member **257** applies force radially inwardly to the
25 valve-servicing assembly **230** to help effect a fluid-tight seal.

1 **[47.00]** FIG. 12 illustrates a fourth embodiment with some more different connection-facilitating means. It is designated as a valve **300** with a valve-stopping mechanism **312**. The valve **300** is similar in many respects to the valve **200** and so only differences will be described in further detail.
5 For convenience, numerals designating parts of the valve **300** are increased by one hundred over numerals designating similar, corresponding, or related parts of the valve **300**.

10 **[48.00]** A first connection-facilitating arrangement illustrated by the valve **300** is a segmented annular groove **360** in an opening-defining portion **323** of the valve **300** that mates with a segmented annular ring **361** in the valve-servicing assembly **330** to form a cam lock. A second connection-facilitating arrangement illustrated by the valve **300** is a segmented annular ring **362** in the opening-defining portion **323** of the
15 valve **300** that mates with a segmented annular groove **363** in the valve-servicing assembly **330** to form a cam lock. A third connection-facilitating arrangement illustrated by the valve **300** is a machine screw **364** that extends through a hole in the valve-servicing assembly **330** (a hole similar to a hole **365** that is identified in FIG. 12 on
20 the opposite side of the valve-servicing assembly **330**) into an interiorly threaded hole in the opening-defining portion **323** that is similar to a threaded hole **366** on the opposite side of the opening-defining portion **323**.

25 **[49.00]** Thus, the valve and methodology of this invention enables the user to remove the valve-stopping mechanism from the opening-defining

1 portion of the valve being serviced through a separate isolation valve into
a pressure chamber for servicing or replacement while the valve being
serviced contains fluid under pressure. The valve being serviced includes
connection-facilitating means that facilitates connection of the isolation
5 valve so that servicing can proceed without shutting down the line.
Although exemplary embodiments have been shown and described, one
of ordinary skill in the art may make many changes, modifications, and
substitutions without necessarily departing from the spirit and scope of the
invention.

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[50.00] What is claimed is:

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